

Functional outcome of Fractures of Distal Femur treated with Locking Compression Plate versus Condylar Buttress Plate-A Comparative Study

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Abstract: Fractures of distal Femur are complex Injuries which test the skill of the surgeon because of the comminution, and involvement of knee joint. A stable fixation with anatomical Reconstruction of the articular surface will ensure a good functional outcome with early union of the fracture with good alignment and a good range of motion. In this study we have compared the results of treating distal femoral fractures with Condylar Buttress Plate in 15 cases versus Locking Compression Plate in 15 patients during the period of June 2009 to January 2012.Locking Compression plate (Angle Stable Contract) provides better stability ,prevents varus collapse and Implant Failure resulting in a better functional outcome.

Key words: Distal Femoral Fractures, Condylar Buttress Plate, Locking Compression Plate.

INTRODUCTION

Fractures of distal Femur are difficult to treat because of articular surface involvement and gross comminution resulting in a high rate of malunion in Varus, reduced range of motion,and shortening of the limb with limping. The management of these fractures has progressed over the years through contoured broad plate, 95 degrees Angled Blade Plate, Dynamic Condylar Screw, Condylar buttress plate and Locking Compression Plate. A high degree of surgical expertise is required to get the correct alignment and Reconstruction of the Joint surface. Meticulous soft tissue handling combined with a thorough knowledge of the principles of Fracture Fixation, will help in avoiding Infection, Malunion, Non-union and stiffness of Knee.

MATERIALS AND METHODS

The study was conducted after approval by the Ethical Committee at KG Hospital and Post Graduate Medical Institute. A total of 30 cases of distal Femoral Fractures in adults were studied from June 2009 to January 2012, out of which fifteen were treated with

Condylar Buttress Plates and fifteen were treated with Locking Compression Plates.

Out of 30 patients, the youngest was 22 yrs old and the oldest was 69 years.

Table-1: Distribution according to age of patients

AGE IN YEARS	NUMBER OF CASES	PERCENTAGE
21-30	8	26.7
31-40	7	23.3
41-50	3	10
51-60	6	20
61-70	6	20

22 of the patients were males 73%. 8 patients were females 27%. Six patients had open fractures and 24 patients had closed fractures.

The major cause of fractures was Road Traffic Accidents in 90% of cases (27 patients) and falls at home in 10% of cases (3 patients).

Lateral approach was used in all cases. Articular surface Fractures were reduced and fixed first with appropriate screws. Intercondylar fracture fixation was then carried out with cancellous Lag screws. The supracondylar part of the fracture was then fixed with

either the condylar buttress Plate or the Locking Compression Plate. Proper alignment of the fracture was checked by Image Intensifier. The stability of fracture fixation was assessed. All the cases were operated by Dr.AS and Dr.AM.

Table-2: Distribution according to type of fracture

TYPE OF FRACTURE	LOCKING PLATE	BUTRESS PLATE
OPEN	2 CASES (7%)	4 CASES (13%)
CLOSE	13 CASES (43%)	11 CASES (37%)

Table-3: Distribution of fractures according to AO Classification

TYPE OF FRACTURE	LOCKING PLATE	BUTRESS PLATE
A3	2 CASES	3 CASES
C1	3 CASES	4 CASES
C2	4 CASES	3 CASES
C3	6 CASES	5 CASES

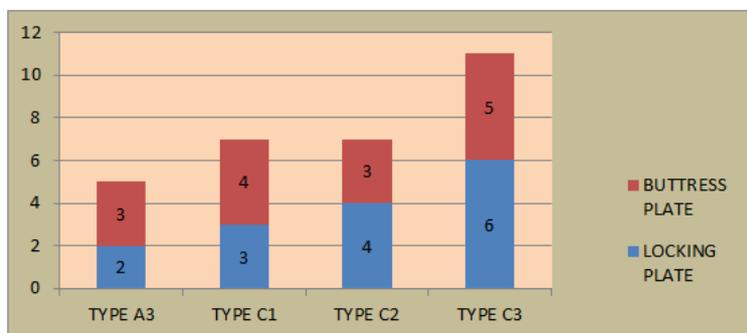


Fig-1: Distribution of fractures according to AO classification

Post-operative care included early mobilisation, Partial weight bearing after six weeks and periodic reviews with X-rays to assess Union.

pain, range of motion, function (ability to walk), angulation and shortening.

Evaluation of the outcome was done with rating system of Neer where the scores are based on

RESULTS

Of the 15 patients treated with locking compression plates the results are as follows

Table-4: Locking compression plate

RESULT	NUMBER OF CASES	PERCENTAGE
EXCELLENT	6	40%
GOOD	7	46%
FAIR	1	7%
FAILURE	1	7%

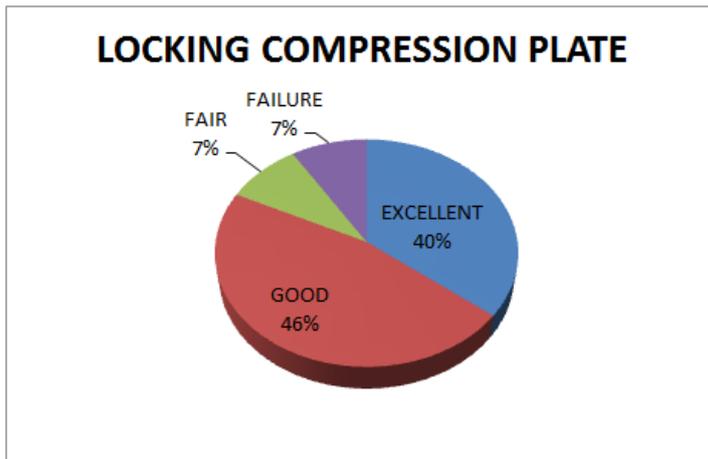


Fig-2: Locking plate-neer's score chart

Of the 15 patients treated with Condylar Buttress Plates, the results are as follows.

Table-5: Condylar buttress plate

RESULT	NUMBER OF CASES	PERCENTAGE
EXCELLENT	2	13%
GOOD	7	47%
FAIR	3	20%
FAILURE	3	20%

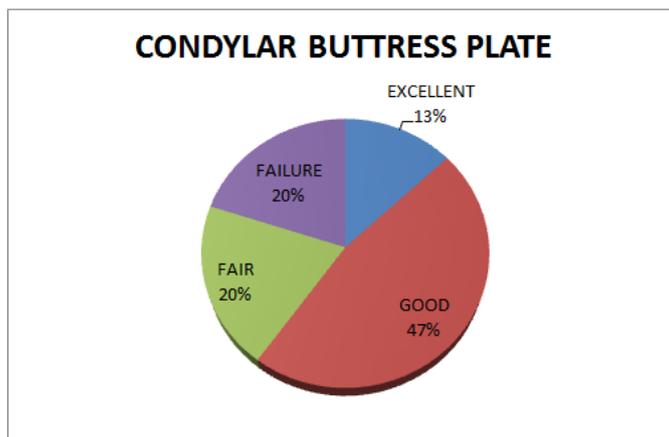


Fig-3: Buttress plate-neer's score chart



Fig-4: Comparison of neer's scores of locking compression and buttress plates chart

DISCUSSION

In a study by Schandelmaier *et al.* [1], 54 patients were treated with locking compression plate for distal femoral fractures. Out of 54 fractures, 6 patients

had bone grafting and mean range of movements is 104°. Most of the fractures were type C and 78% of patients had good functional results by Neer's knee score. 13 patients had malalignment.

Siliski [2] in 1989 evaluated 52 intercondylar femoral fractures (AO type C) treated with 95° condylar blade plate, condylar buttress plates, T-plates and straight plates. Cancellous bone graft was used. Average time of healing was 13.6 weeks. Seven fractures healed in 4° to 8° of varus-valgus malalignment and three fractures healed in 5° to 10° of recurvatum. Shortening of 1 to 3cm occurred in 15 patients. The average arc of motion of the knee was 107 degrees, with an average knee motion being 113° for C1 fractures and 99° for C3 fractures. Overall C1 fractures resulted in good or excellent outcome in 92% of cases, whereas C2 and C3 fractures resulted in 77% excellent or good result.

Several studies have assessed the value of locked implants in treatment of distal femoral fractures [3, 4, 5, 8, 9, 10, 14, and 15]. The commonly used implant in these series is the Less Invasive Stabilisation System (LISS). Zlowodzki *et al.* [16] analysed the outcome of these studies that have assessed the value of locked plates as part of a systematic literature review. Average non-union, fixation failure, deep infection, and secondary surgery rates were 5.5%, 4.9%, 2.1%, and 16.2% respectively. The technical errors that have been reported for fixation failure comprised of waiting too long to bone graft defects, allowing weight bearing too early, and placing the plate too anterior on the femoral shaft. Still, the LISS achieves very high rates of union (100%) and excellent clinical results (88%), based on the Lysholm score in multiple studies [6, 7, 11, 12].

In a study, Forty-six patients with distal femoral fractures that were treated with cannulated locking screws distally and bicortical non-locked screws for diaphyseal fixation using an open approach and indirect reduction technique, Twenty-five patients suffered from open fractures. Six of the 46 patients (13%) had implant failure. All of the failures occurred in type C3 fractures, with 4 of the 6 being open fractures. In this series with ORIF the authors concluded that the locking condylar plate should solely be used when conventional fixed-angle devices like the angled blade plate (ABP) cannot be positioned. They recommended accurate fracture reduction, fixation along with judicious primary bone grafting, and protected weight bearing to decrease the risk of implant failure with locking plates [13].

Multiple biomechanical studies have compared locking plates and conventional fixed-angle implants like the ABP (angled blade plate) or the DCS (Distal Femoral Plate) in distal femoral fracture models [19, 20, 17, and 18]. All of these studies reveal that locking plates with unicortical or bicortical diaphyseal fixation have adequate axial stiffness but more elasticity when compared to conventional fixed-angle implants. Although they have less torsional stiffness, the studies that evaluated torsional stiffness have shown that the

distal fixation in locked implants is typically maintained while conventional fixed-angle implants have a higher rate of distal cut-out from the femoral condyles [7].

In our series all cases united within the expected time (average 11 weeks) but for five cases which were compound, had deep infection requiring repeated debridement and resulted in delayed union. Eight cases treated by condylar buttress plate had varus collapse as against 2 cases treated by Locking Compression Plate. The mean range of motion was 70 degrees to 140 degrees in patients treated with Locking Compression Plates and 50 degrees to 110 degrees in patients treated with Condylar Buttress Plates.

All data were analysed with Statistical software package (SPSS, Version 18.0 0). The mean difference in pain and shortening between the two groups is not significant. The mean difference in Range of movements, Varus angulation and function between the Locking Compression Plate and Condylar Buttress Plate is significant. The Mean difference in functional outcome between the two groups, according to Neer's Score is statistically significant ($p < .0590$).

In our series, of the 15 patients treated with Locking Compression plate, the results were excellent in 40% of cases and in 15 patients treated with Condylar Buttress Plate the results were excellent in only 13% of cases. Good Results were seen in equal measure in both groups. The fair and poor results were seen in more no of cases in patients treated with Condylar Buttress Plate 20% each as against 7% each in patients treated with Locking Compression Plate.

The higher percentage of excellent results (40%) in patients treated by Locking Compression Plates are due to the angular stability provided by LCP preventing varus collapse, better Range of Movements and better Functional Outcome.

The results are scored as good in both groups due to the Range of Movements of knee, being only moderate. The results were fair in 4 cases due to poor knee motion and shortening. Failure in 4 cases was due to Infection and angulation. Our results correlate well with the above references in that in Type C3 fractures Locking Compression Plates give better functional outcome than Condylar Buttress Plates.

CONCLUSION

The management of distal Femoral Fractures is difficult even for the experienced surgeon. The use of Locking Compression Plates in Type C3 Fractures resulted in better functional outcome in terms of prevention of Varus collapse and Increased range of movements of the knee joint. The higher percentage of excellent results according to Neer's score in the Locking Compression Plate Group tilts the balance in

the choice of implant for the management of distal femoral fractures towards Locking Compression Plate.

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